

REMARKS

The Final Office Action mailed February 23, 2007 has been received and reviewed. Claims 1, 2, and 4 through 14 are currently pending in the application. Claims 1, 2, and 4 through 14 stand rejected. Applicant respectfully requests reconsideration of the application in light of the remarks which follow.

35 U.S.C. § 103(a) Obviousness Rejections

Obviousness Rejection Based on U.S. Patent Application No. 2003/0134450 to Lee

Claims 1, 2, and 4 through 14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Lee (U.S. Patent Application No. 2003/0134450), hereinafter “Lee” in view of Akram et al. (U.S. Patent No. 6,013,948), hereinafter “Akram.” Applicant respectfully traverses this rejection, as hereinafter set forth.

The 35 U.S.C. § 103(a) obviousness rejections of claims 1, 2, and 4 through 14 are improper because the Lee reference, as relied upon by the Examiner under 35 U.S.C. 102(e) and, which is only available as a reference under 35 U.S.C. 103(c), not 35 U.S.C. 103(a) as alleged, is not prior art under 35 U.S.C. 102(e). Specifically, the sole inventor of the Lee reference, Teck Kheng Lee, is one and the same as the sole inventor of the present application, Teck Kheng Lee. Therefore, the Lee reference does not disclose an invention by “another” as required by 35 U.S.C. 102(e).

Further, the Lee reference which, as noted above, is available as a reference only under 35 U.S.C. 103(c), is commonly assigned to the assignee of the present application, Micron Technology, Inc. The Examiner is respectfully directed to the Assignment Records of the Office, which will reveal that the Lee reference is assigned to Micron Technology, Inc. at Reel 012507, Frame 0133 and that the present application is assigned to Micron Technology, Inc, at Reel 013239, Frame 0727 by virtue of the assignment of its parent application Serial No. 10/150,901, which assignment extends to the present application by the terms thereof. Thus, Lee is disqualified as prior art.

Therefore, the rejection of claims 1, 2 and 4-14 is improper and should be withdrawn.

Obviousness Rejection Based on U.S. Patent No. 6,338,985 to Greenwood

Claims 1, 2, 5, 8 through 10, 12, and 14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Greenwood (U.S. Patent No. 6,338,985), hereinafter “Greenwood” in view of Akram. Applicant respectfully traverses this rejection, as hereinafter set forth.

M.P.E.P. 706.02(j) sets forth the standard for a Section 103(a) rejection:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, **the prior art reference (or references when combined) must teach or suggest all the claim limitations.** The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant’s disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). (Emphasis added).

The rejection of claims 1, 2, 5, 8 through 10, 12 and 14 is deficient in several respects. First, contrary to the assertion by the Examiner, Greenwood’s “recesses” identified as land openings 32 are facing away from semiconductor die 40 which is assembled with substrate 12 and, so, never receive solder bumps 42. If Greenwood could be said to have a plurality of recesses (apertures 36, not land openings 32) in the first surface of the substrate 12 and through *any* layer (solder mask layer 34), apertures 36 are not of a size and configuration so that the solder bumps 42 of die 40 are “substantially received” in the apertures 36. As demonstrated at Col. 5, lines 21-35, the space between die 40 and solder mask 34 is about 0.002 inch, while the distance between die 40 and pads 24 is about 0.004 inch when solder bumps 42 are received in apertures 36. Thus, only about one-half of the height of each solder bump 42 is received in an aperture, which is confirmed by Greenwood’s drawing figures. It is also noted that the space between die 40 and solder mask 34 is filled with a molten plastic 58 which flows between die 40 and substrate 12 during encapsulation of the assembly. Col. 6, lines 7-36 If solder bumps 42, before or after reflow, were “substantially” received in apertures 36, the encapsulation operation taught by the reference could not be accomplished.

Further, Applicant asserts that solder mask 34, in which apertures 36 are formed by Greenwood, is not a “dielectric layer” corresponding or equivalent to that claimed by Applicant. Instead, insulative layer 15, which is opposite solder mask 34 and faces away from die 40, is the dielectric layer in the Greenwood assembly. See Col. 4, lines 5-13. This is in concurrence with the position taken by the Examiner and demonstrates the deficiency in the rejection.

In addition, it is respectfully asserted that Akram fails to remedy the deficiencies in the teachings of Greenwood on several counts. First, each recess in the first surface of the interposer substrate 12 of Akram is in communication with only a *single opening* in the second surface. See FIGS. 1, 3 and 6A through 6F of Akram and the accompanying descriptions. Specifically, a single die mounting cavity 16 is in communication with a single stepped opening 18, 20. Col. 4, lines 18-27 Thus, the combination of Greenwood and Akram fails to teach or suggest all of the limitations of claim 1.

Moreover, the functions of the die mounting cavity 16 and stepped opening 18, 20 differ from those of the interposer substrate of Greenwood, which is used with a flip-chip die. In Akram, a bare die 14 having contacts (bond pads) 24 is disposed active surface down in die mounting cavity so that contacts 24 are exposed through stepped opening 18, 20 for wire bonding to first contacts 36 of substrate 12. The “purpose” of stepped opening 18, 20 disclosed by Akram and relied upon by the Examiner, which is to expose contacts 24 of a die 14 received face-down in die mounting cavity 16 for wire bonding to first contacts 36, provides no suggestion or motivation whatsoever to modify the Greenwood assembly. Thus, there would be no motivation, absent impermissible hindsight reliance upon Applicant’s own disclosure, to combine Akram with Greenwood, as neither Akram nor Greenwood provides a suggestion or motivation to form an opening in the insulative layer 15 of Greenwood in communication with one of the apertures 36 in solder mask 34. Consequently, there would also be no reasonable expectation of success of the attempted combination.

Therefore, the rejection of claim 1 should be withdrawn.

Claims 2, 5, 8 through 10, 12 and 14 are allowable as depending from claim 1.

Claim 2 is further allowance as apparently the Examiner has misread Col. 5, lines 4-20 of Greenwood. The cited passage is merely a cursory description of the C4 flip-chip attach method

developed by IBM. As implemented by Greenwood and as noted above, the Greenwood assembly, after solder bump reflow results in a structure wherein the die 40 is spaced from solder mask 34 sufficiently to permit molten plastic 58 to flow therebetween during encapsulation. Therefore, die 40 and solder mask 34 are not in contact. As noted previously, insulative layer 15 of Greenwood faces away from die 40 and, so is never in contact therewith.

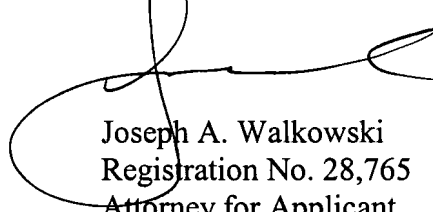
Claim 5 is further allowable as, if the Examiner were to rely upon solder mask 34 of Greenwood as the dielectric layer through which recesses (apertures 36) partially receiving solder bumps 42 of die 40 are formed, solder mask 34 cannot also be relied upon as another element disposed over the plurality of conductive elements 34. Further, if insulative layer 15 is relied upon as the dielectric layer, this layer faces away from die 40, solder bumps 42 are never received in land openings 32 and, again, the rejection is untenable.

It is respectfully submitted that the rejection of claims 1, 2, 5, 8 through 10, 12, and 14 is untenable and should be withdrawn.

CONCLUSION

Claims 1, 2, and 4 through 14 are believed to be in condition for allowance, and an early notice thereof is respectfully solicited. Should the Examiner determine that additional issues remain which might be resolved by a telephone conference, he is respectfully invited to contact Applicant's undersigned attorney.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Joseph A. Walkowski', is written over the typed name and registration number.

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